The Xtal Set Society Newsletter

Volumn 26, No.1 January 2016

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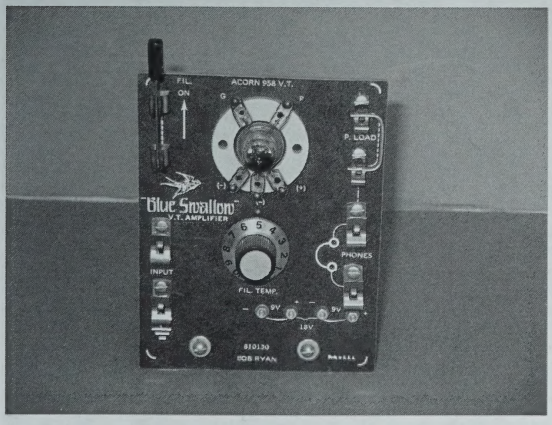
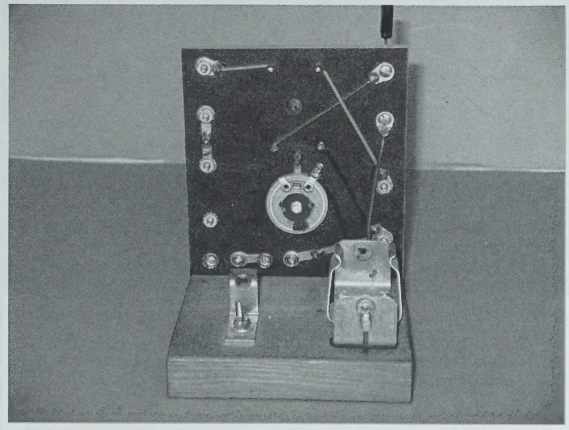
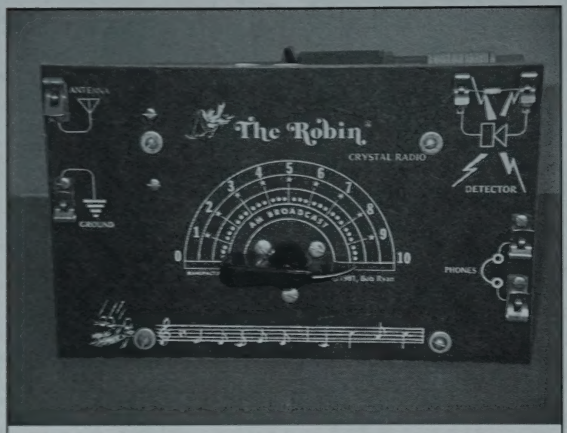
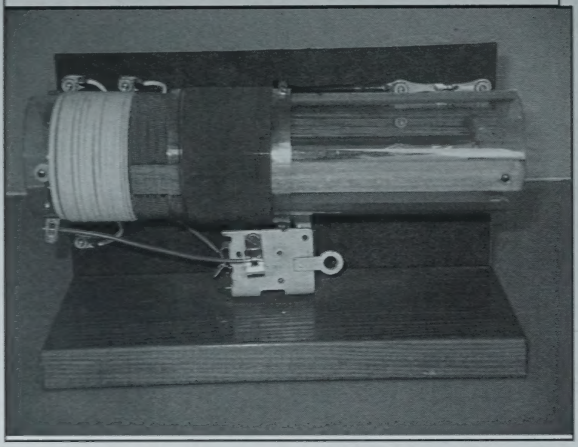
Bill Holly's Pictures of Bob Ryan Radios

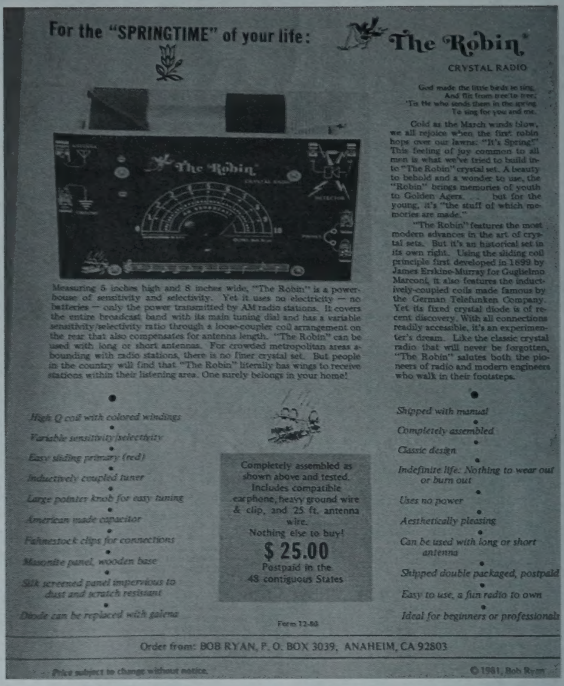
Enjoyed Randall Shreve KD7PCW's article on Bob Ryan and his Crystal sets. I've had one of Bob's "Robins" and a matching "Swallow" one tube amplifier in my collection for about 25 years. Thought you would like some pictures of the sets and the original sales brochures and owners pamphlets.

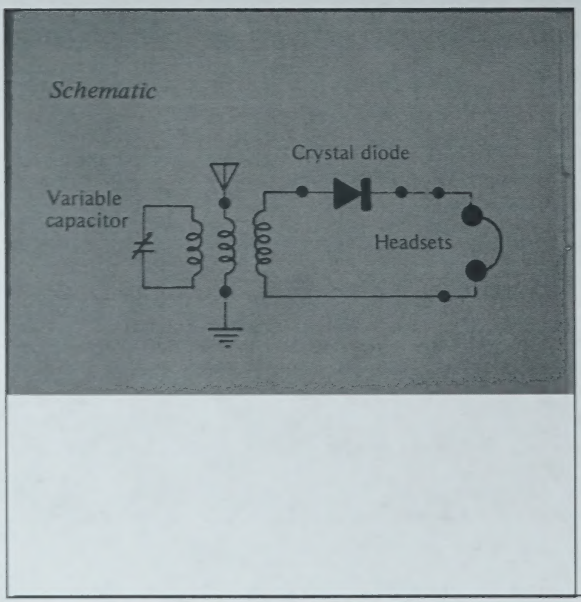


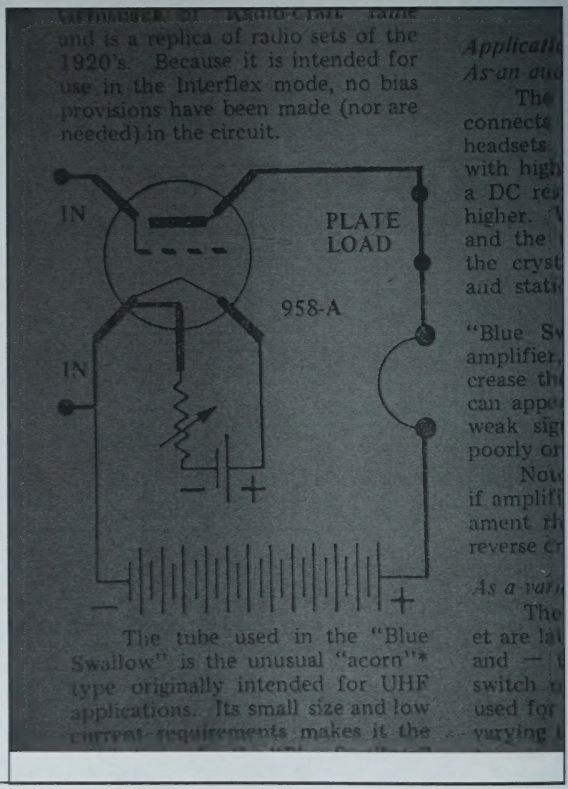






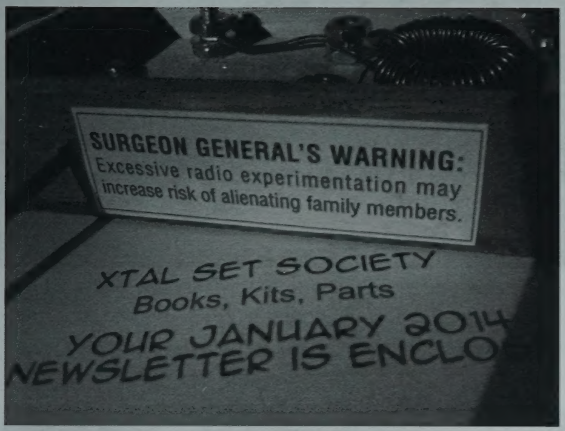


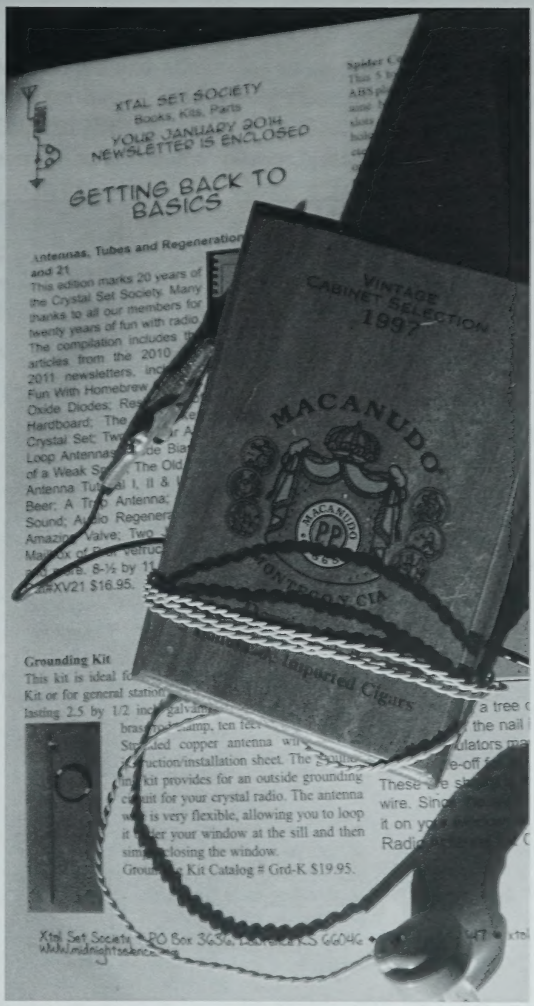




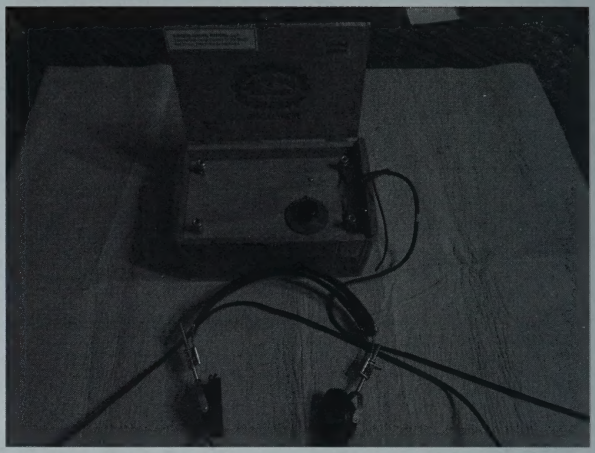
Mark Rose Cigar Box Radio

FT-82-61 Toroid wound with 6 feet (42 turns) of #22 enameled. IN 34 diode bridging antenna and coil. Fixed tuning to low end of band. Directional table top antenna changes station slightly. Not hand-holdable because this causes station to fade in and out. Grounded to metal table leg.



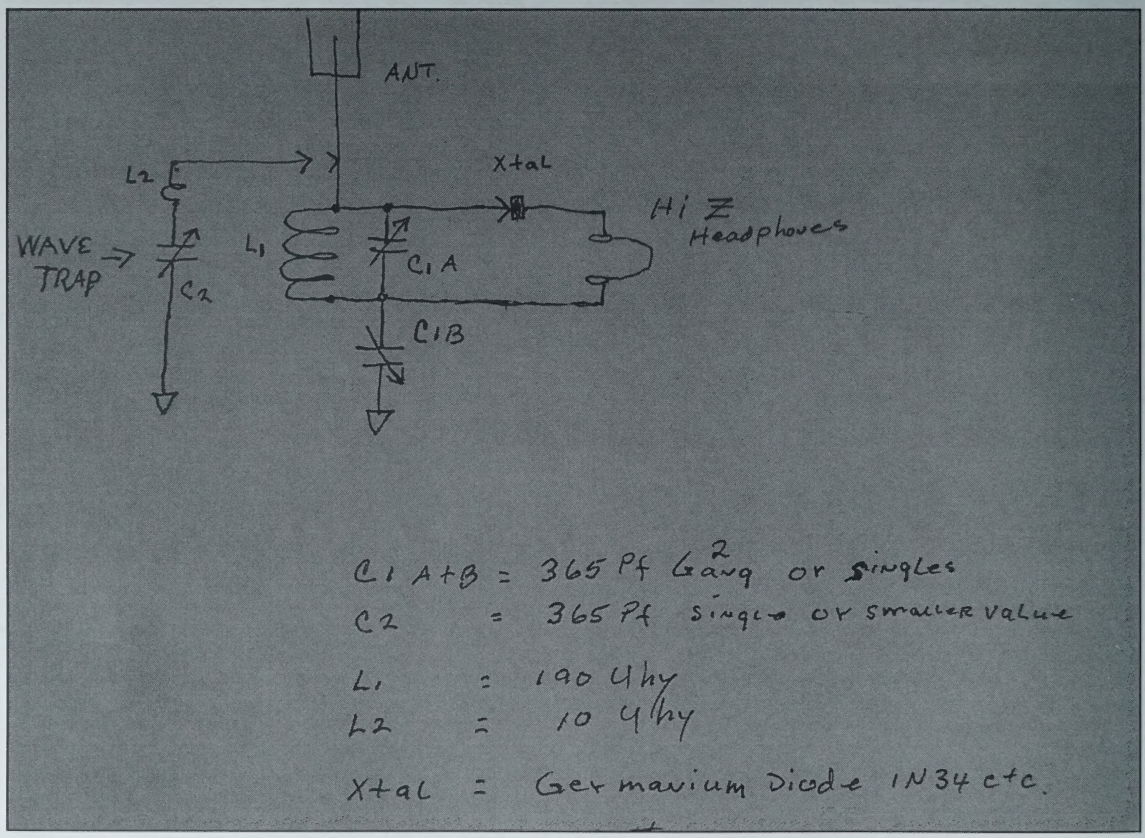


Jim Inglett Cigar Box Radio



This set works good and is very selective. It is parallel and series tuned. You do get the Hi-Powered shortwave that overrides your distant AM Stations and a Wave Trap suffices to eliminate that, the values quoted for the Trap are approximate.

A 50 foot Antenna is loud with this Set and might be easier to tune too. Remember High Impedance Headsets do not load down your tuning and sounds a lot louder with better quality. Use 62 K Ohm resistor at headphone connections for crystal Hd set.



A Diversity Crystal Set
By Phil Anderson, WØXI

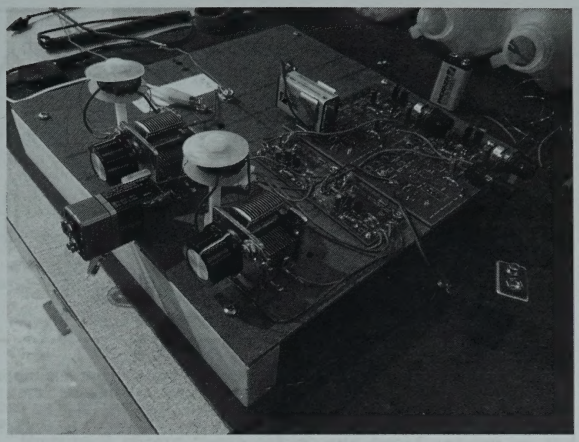
"Antenna diversity, also known as **space diversity** or **spatial diversity**, is any one of several wireless diversity schemes that uses two or more antennas to improve the quality and reliability of a wireless link." (wikipedia).

I use diversity reception for CW when using my Elecraft K3 HF transceiver. My SteppIR Vertical antenna is attached to the ANT1 port (TX/RX) and my homebrew Beverage antenna is attached to the AUX (receive only port). The two identical receivers in the K3 collect these signals and pass them through the digital signal processing unit of the K3. I assigned the resulting signal from the vertical antenna to the left earphone of my 8 ohm Plantronics headphones and the processed signal from the beverage antenna to the right earphone. The summed signal can be adjusted by varying several controls on the K3 and the volume pots for each receiver. The beverage antenna favors horizontally polarized radio waves and the vertical, of course, favors vertical polarization. It is often the case that combining these signals results in better overall reception.

It occurred to me not long ago that using this diversity scheme with a pair of crystal sets should improve reception too. Indeed it does. My first try was successful, wiring up and using the crystal set circuit shown in Figure 1. A picture of the assembled circuit is shown in picture 1. Let's take a walk through the schematic.

Keep in mind that Figure 1 shows one of the two receivers used, wherein the second copy is identical to the first. At left, L1 - fed by an antenna - depicts a coil of four turns wrapped on top of coil L2. L2 consists of 58 turns of #26 magnet wire. These coils are wound on a FT-82-61 ferrite core, ideal for the AM band. A 365 pf air variable was added in parallel with L2 to tune the desired frequency.

A JFET detector was used to detect the audio of the AM signal, rather than simply using the usual 1N34 germanium diode. The advantage of the JFET circuit is that it presents a very high impedance to the tuned circuit, L2-C1. As such, the L2-C1 tank circuit Q is

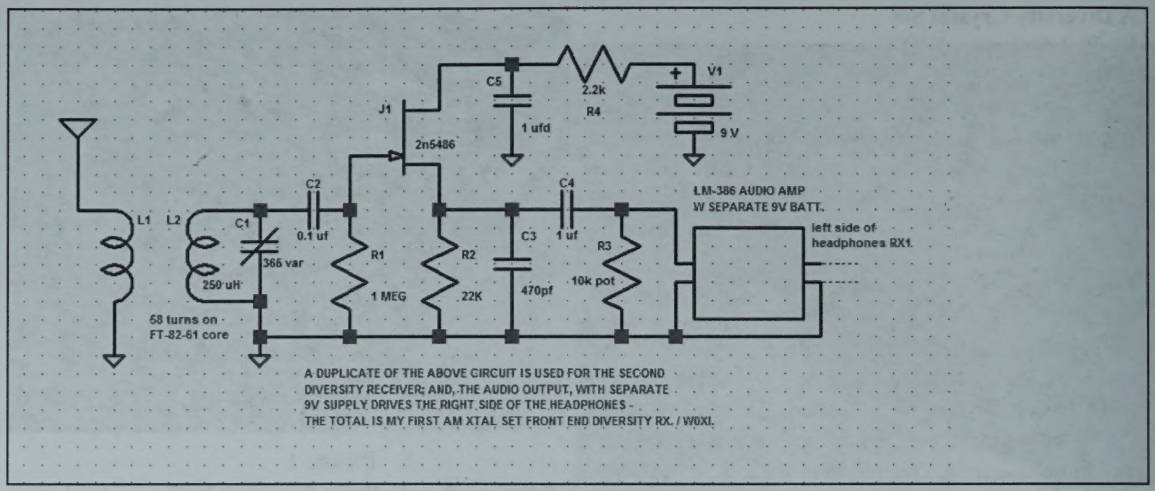


Picture 1

maintained and allows for sharp tuning and a higher detector output. The battery circuit in the drain of the 2N5486 JFET is used to bias the JFET at about 1 volt across the R2 source resistor. Note that the RF bypass cap in the source C3 is 470 pf; this is added to improve the fidelity of the audio.

The output of the source circuit is then feed to a 10K pot which drives an LM386 audio amplifier. The output of one of the two receivers feeds the left ear of a pair of 8-ohm headphones and the output of the second receiver drives the right ear of the headphones.

The JFET detectors for the two receivers are shown in the middle of picture 1. The two audio amplifiers are shown at upper left. Each has its own 9 voltage battery. I did this to isolate feedback from one amp to the other. It worked. Each JFET circuit uses a portion of a PCB offered in our JFET kit. The audio amps use a portion of the PCB used in our MK484 AM Radio Kit. It was just easier to wire it up this way. All was interconnected with hookup wire. A 3.5 mm headphone jack on one of the two audio PCBs was used for attachment of any 8-ohm headset. Another solution could have been to put an audio step-down transformer in the drain of the each JFET. I opted for the pot with the LM386 IC in order to be able to adjust volume on one or both of the separate audio circuits. That turned out to be critical when operating this diversity set.



Putting the Diversity Set on the Air

For my first try, I chose to use 50 feet each for the vertical and horizontal antennas. The vertical ran up the outside of the house 25 feet to a vent in the attic and continued another 25 feet horizontally inside the attic and to the west from there. For the horizontal antenna, it ran out the same window, up about 8 feet and then horizontally 40 feet to the north, attaching to the back fence. I grounded the set to a nearby cold copper water pipe – which is attached to the electrical safety ground of the house.

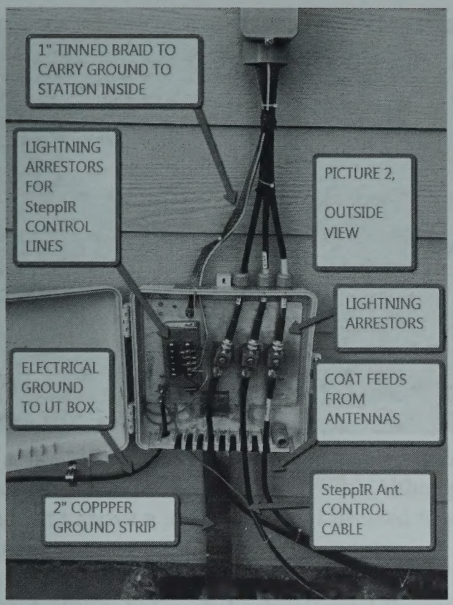
I then tuned each circuit with its variable cap for the local station, 1320 on the AM dial. I noticed right away that too much volume on one receiver would dominate the results in my headphones. Adjusting the audio pots for a balance in the earphones did the trick. The local station nearly blew my ears off; the system had way too much gain. I then turned to 580 in Topeka, KS 30 miles away and the audio volume was moderate. It was fun noticing that changing the volume of either pot would pull the audio from one ear to the other. This would also happen to some extent when the variable capacitors were adjusted one at a time. I quickly found that low volume on the amps and adjustment back and forth on the variable caps provided best results. These initial trials were at mid-day. At ten at night I noticed a greater range in the audio from the signals received in the two antennas. In addition, I could clearly tune over 15 stations. With the weak signals I had to adjust the tuning caps and audio volume controls to get best results. To my surprise – which is not the case for single crystal radios set – signals from the more distant stations seemed to be up in volume, perhaps benefiting from the diversity arrangement? I need to play with the rig further.

As an aside, when finishing the first radio of the pair but not the second, I tried attaching both antennas to the first radio input. To my surprise I obtained louder signals. The variable cap, of course had to be adjusted to obtain this result.

I noticed when operating the pair that there was some noise reaching the phones in addition to the audio. The noise was a bit gravelly. Noting this, I moved the ground of the diversity radio to the single-point-grounding-system (SPGS) of my ham station. Immediately the noise all but disappeared. We'll report back after playing with this Diversity Crystal Set a bit more.

My ham station Single Point Grounding System.
In my ongoing quest to reduce RF noise in my ham radio shack, my latest project was to build a SPGS for all wires coming into the station from outside the house. And keep in mind that all of the equipment powered in my shack comes from just one breaker at the power panel.

My first step was to decide what I wanted to put into the SPGS enclosure on the outside wall facing my station. {See Picture 2} I currently run three antennas, SteppIR vertical, homebrew beverage and a 40-meter

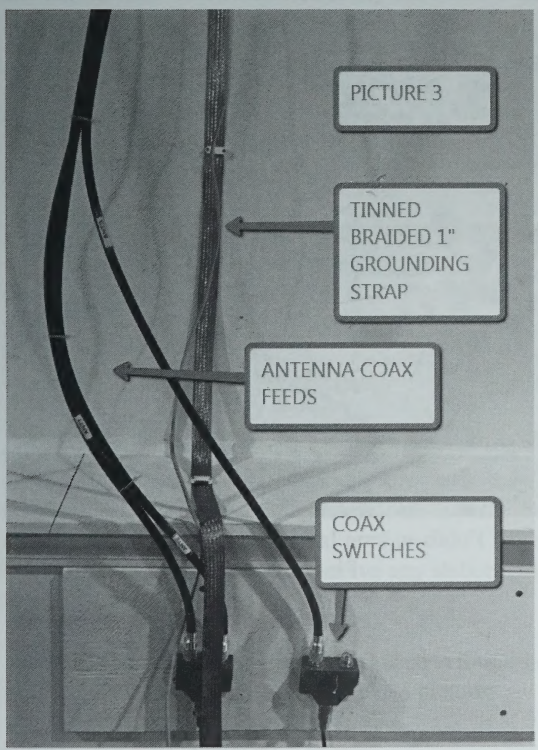


Picture 2

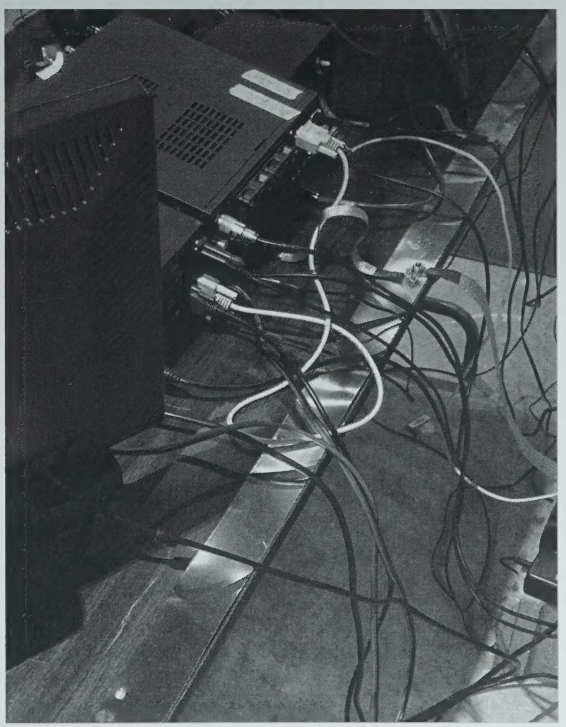
dipole. The coax for these comes in at the bottom of the box, along with the 2" copper grounding strap, house electrical ground #4 wire at bottom left and finally a control cable from the SteppIR antenna. At the center of the enclosure, three lightning arrestors are shown along with antenna control cable arrestors at the left.

Coax for the three antennas and cable control, along with 1-inch tinned grounding braid then exit the box at the top via waterproof connectors and enter the house via a right-angle wall adapter.

Inside the house:
Picture 3 shows these cables and braid exiting on the station wall inside the house. I added coax switches below the panel for flexibility. The braid extends down the wall to the station and is connected to a 5 foot long piece of 2-inch copper stripping at the back of the station table. {See Picture 4} Smaller sized braid with lugs are then used to connect station components to that part of the SPSG system.



Picture 3



Picture 4

Back Outside the house:
In order to install copper rods every 14 to 16 feet or so out to the base of the vertical antenna, I needed to cut an 18-inch strip in one section of the backyard patio. {See picture 5}

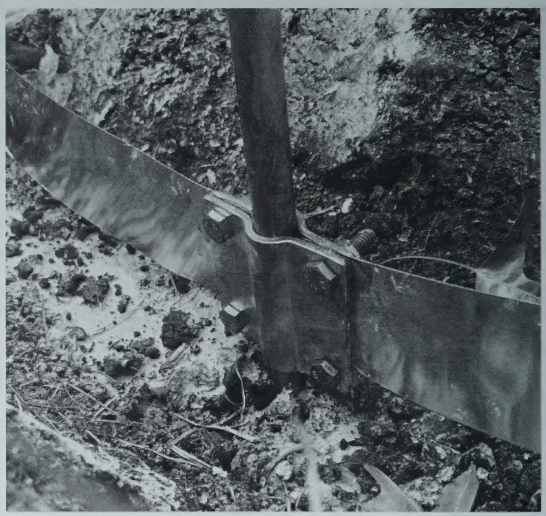
Picture 5

Picture 6 displays how the copper strip was installed and run from the SPGS intake box all the way to the vertical. The strip comes in whatever length you buy and I laid it along the one foot deep trench I dug and attached it to each rod as noted in the picture. These parts were obtained from DX Engineering along with the SPGS enclosure and lightning arrestors.

All copper to aluminum and all copper to copper contacts were cleaned ahead of time and coated with anti-seize lubricant and SS-30 Pure Copper Lubricant to ward off oxidation.

Upon completion the results were immediately obvious. The noise levels reported by my Elecraft P3 Panadapter were down compared to before; adding the beverage to that mix lowered my noise level for the second radio another two S units.

Now let's take you back to the Diversity Crystal Set at the beginning of this article. Recall that when I moved the ground strap for the set from the house ground (of a different breaker circuit) to the SPGS a great deal of the noise heard in the crystal set simply went away. Nice!



Picture 6

From: Brad Buck
Subject: LEDs as xtal detectors

In a recent newsletter, a response to the question "Can an LED be used as a crystal/detector" was "no". This has been counter to my experience on the outskirts of a larger city, where an LED can perform the detector role quite well.

I too was skeptical of course, as I had been warned that for instance newer silicone diodes weren't good for crystal radios due to voltage drop, and an LED implies wasting good signal to generate useless light! But a friend of mine (W8DMR, a fellow newsletter subscriber) recommended that I try it, Although my friend isn't above a practical joke, I decided to give it a test.

I dusted off my "More Selective Crystal Set" built to plans in Alfred Morgan's "Boy's Second Book Of Radio and Electronics" and connected to my old Radio Shack longwire antenna (60' or so outdoors and up high).

Inserting a red LED, I was able to pick up almost as many stations as before (4 or 5) but with lower volume. The added feature was the LED flickering to the volume level of some more-powerful local stations. Neato!

I tried various LED's, and it seemed that the color red worked best, despite having purchased a green LED that claimed to work at a lower current. Red produced the best volumes, and best illumination. I was not able to hear any stations that didn't illuminate an LED.

The LED detector was inferior to the trusty old 1N34 germanium diode, as the LED volumes were a bit lower, and I dropped a station or two. So while not optimum, it was still pretty good, and made for an interesting effect. If I lived in a more rural area or didn't have a longwire antenna, I might not receive any stations with an LED detector/crystal.

A future project will involve an LED used to illuminate a crystal radio dial. I'll be sure to take a picture!

[Editor: Do send it to me!]

Brad,
sounds interesting. Your results make sense to me. Bigger voltages across the LED would be enough to generate a bit of light. Lower, moderate signals, would not and hence your result. It would be interesting to use a generator and pot to vary the current through and the voltage across the RED Led, create a plot and compare that with the plot of the 1N34.etc.

Stay in touch; I might dink around with the above. Would be neat if you lived in Chicago near WGN and had a dozen LEDs in your living room with the lights off for XMAS all blinking,.it would be an XTAL XMAS! 73!

From J. Jason Wentworth
Hello All,

I live on the second floor of an apartment building (it's wood, fortunately, for RF purposes), where setting up a normal wire antenna is impossible. However, I have a set of instructions for Hearever's "Midget Monitor Radio" (a modern germanium diode version of a crystal set), and they suggest using telephone cords as antennas in two different ways (which leads to my question below). The "Midget Monitor Radio" instructions say to connect the radio's antenna lead alligator clip to "The metal finger guard on dial telephones or the metal screw on the bottom of non-dial telephones." Here is my question:

Which of the four conductors (tip, ring, battery, or ground) in an RJ11 telephone cord makes the best antenna? (On eBay, today I ordered two RJ11 adapter cords, which plug into standard RJ11 modular telephone jacks and have spade lug connectors on their other ends. One cord has two conductors [the middle two], and the other cord has all four conductors. I also ordered screw-connector terminal strips, to which I'll connect the spade lugs. I'll connect my crystal radio's antenna terminal [I have several crystal sets] to

just *one* of the RJ11 telephone cord conductors at a time.) My Rocket Radio has no ground connector, but my other crystal radios do; I could connect them to the ground screw on an AC electric outlet if necessary. Many thanks in advance for your help! (I'm sure I'm not the only Xtal set fan who has to use a telephone cord as an antenna.)

My Sept. news letter arrived on Thursday the second. As normal, I took it out of my mailbox and read it cover to cover. Then I went back and re-read the article on impedance and highlighted various sections. On Friday I re-read the article on impedance. I found the article to be very informative and easy to understand. Thanks Phil, for the article.

Hey Ron,

Glad you liked it and it worked for you. Yup, it turns out that the crystal set is indeed more complicated than most think. It speaks to those of us who want to know what is going on behind the scenes.

By the way, are you also a radio amateur, i.e. have an FCC license? If not consider it.....I'm still enjoying the hobby at my 74th birthday.73, Phil, W0XI.

From Frank (WB7NZI)
Say, all you gageteers and inventors. Here is a worthy simple project, and I would like to hear about it if you do it. (I've been so busy gardening and making wine, picking berrys, working on greenhouse, etc, this Summer out here in the North West, haven't had time to get into my laboratory, ha ha, "hidee-hole," to work on this idea.)

BUT, to devise a xtal/diode set that receives 5.085 Mhz. That's right, ye'ol' Art Bell program blasts across the USA on Short Wave. Should be a simple solution of correct coil, and an outdoor antenna. I want to know exactly "what works best," as Tennessee is a long ways away from the NW corner of Washington up here near the Canadian border. And, while ur at it, maybe keep it in the area of 4.840 Mhz too, which is the Alex Jones short wave freq, or hey, "pop in and pop out" coils????

Or two coils, switchable with a toggle??? Hey, all kinds of ideas fun. Oh sure, we can use our ham rigs or old sw rigs to listen, but that just isn't the right atmosphere and spirit. But just in case anyone gets a head start on the project, share it with me and others. This could be a lot of fun.

Hello Patricia,

It is that time again to renew! I enjoy different articles in our newsletter each time. What I do like are stories about what someone did as a kid with radio projects.

Ken Ladd's story about "Rat Radio" was interesting. He got help from the same fellow that helped me. That was Elmer Osterhoudt. I am 80 years old and I knew Elmer.

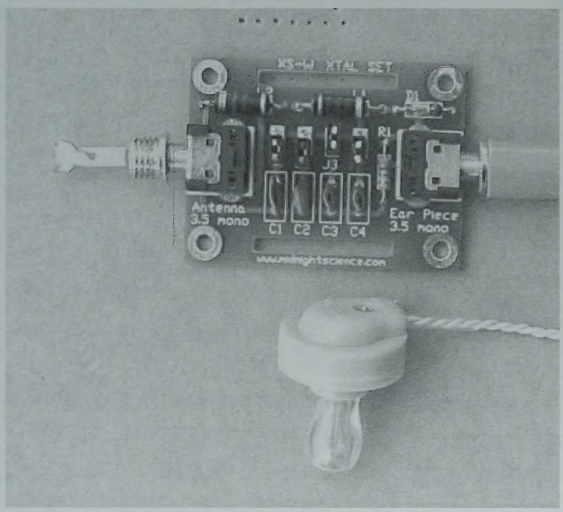
Jim, N5WUT

IMPORTANT MESSAGE
FROM THE QUEEN

The society has a new email address

xtalqm@gmail.com

The sunflower.com address will no longer be available



This is our smallest crystal set yet, measuring 1.5 by 2 by 0.5 inches. It's small enough to wear on your wrist, and includes jacks for plugging in an antenna and ear piece. Set is tuned by selecting a set of capacitors wired in parallel with the miniature molded coil. Kit is constructed by soldering the parts onto the printed circuit board provided. Plugs to match the jacks, along with an ear-piece are provided. As with all sets, it requires an antenna, not provided. Cat # XS-W $19.95

12-31-15

THE XTAL SET SOCIETY
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We are dedicated to once again building and experimenting with radio electronics, often—but not always—through the use of the crystal set, the basis for most modern day radio apparatus. This newsletter helps support our goal of producing excellent quality technical books that encourage learning and building. To join the society and receive one year of the bi-monthly newsletter, remit $14.95 to The Xtal Set Society. Canadians, please remit US $15.95. Outside the US and Canada please remit US $21.95.

Please send articles and correspondence to the following address:
PO Box 3636, Lawrence KS 66046

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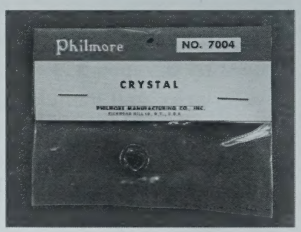
Occasionally in our coming and going, we come across some special items. These Philmore items were found on such a trip.

Mounted Galena - Philmore 7004



The Philmore 7004 is a single mounted galena crystal; that is, the galena rock is set in a disc of woods metal. The disc fits in our brass cup holder found on our parts page. It also fits in a cup included in the Philmore 7010 Unmounted Galena Detector; see the next item. **Mounted Galena Philmore $4.95**

Unmounted Crystal Detector Philmore 7010

The Philmore 7010 is an unassembled (unmounted) crystal detector kit. While a bit hard to see in the package, it consists of a handle on a rod, a cat whisker, a ball joint and U-shaped holder for the ball and rod, with screw and nut. **Unmounted Crystal Detector Philmore $5.95**

ORDER FORM (5/2013) Description	Cat#	Qty	Price
Subscription The Xtal Set Society Newsletter 1 year			14.95
Subscription Canadian 1 year (in US dollars)			15.95
Subscription International 1 year (in US dollars)			21.95
Shipping (delete if subscription ONLY) 1st Class mail 1-2 items $5.95, 3-4 items $7.95, 5 or more $8.95 *{International orders specify surface or air-mail, shipping will be determined on a per order basis, please use VISA/MC only.}*			
TOTAL Kansas residents please add appropriate sales tax			
We accept checks, money orders, or VISA/MC			
VISA MC Card# EXP			
Signature:			
Name:			
Address:			
City State/Zip code:			
Phone E-mail:			
Orders are filled promptly, but allow 2-3 weeks for delivery